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## SOME LICHENS FROM VESTFJELLA, DRONNING MAUDS LAND, ANTARCTIS

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ABSTRACT. — 23 species are recorded, 5 of which are only determined to genus. For some taxa, taxonomic and nomenclatural remarks are given. Phytogeographical relations are discussed.

### INTRODUCTION

A survey of the Vestfjella mountains situated in the Dronning Maud Land ranges, was one of the objectives of the Norsk Polar-institutt expeditions of 1977. Two of the expedition's members, cand. real. Y.T. Gjessing and Dr. L. Sømme, collected lichens there. Further material was also obtained from the area during an expedition in 1979, made by cand. real. T. Winsnes and tech. ass. A. Haugerud. These materials form the basis of this paper. The lichens are deposited in BG. An account of lichens from the area was previously published by LINDSAY (1972), who also gave an extensive description of the topography, geology, climate and plant habitats of the area.

### LIST OF LOCALITIES

1. Skansen, N-faced slope.
2. Mountain ridge without name, 3 km E of Muren. W-faced slope, 450 m.
3. Pagodromen, N-faced, 500 m.
4. Kjakebeinet, SW-faced, 600 m.
5. Steinkjeften, NE to NW-faced, 350-400 m.
6. Audunfjell.
7. Muren, S-faced slope.

These localities were visited by L. Sømme in the period 22.1-5.2.1977.

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8. Plogen a) visited by Y.T. Gjessing in Feb. 1977.  
b) visited by Winsnes and Haugerud in Jan.-Feb. 1979.
9. Fossilryggen.
10. Basen.  
Visited by Winsnes and Haugerud in Jan.-Feb. 1979.

### ENUMERATION OF THE SPECIES

The arrangement is alphabetical. Only in a few cases synonymy is given. Species of uncertain identity have been treated in some detail when there is ample material for further investigations. In addition, there occurred small specimens (one species each) of the following genera : *Acarospora* (sect. *Phaeothallina*), *Caloplaca*, *Lecania* and *Lecidea* s. lat. These taxa have not been treated further.

#### *Acarospora chlorophana* (Wahlenb.) Massal.

The material of this taxon from Vestfjella has apothecia, but no mature asci were found. It is very similar in habit to *Biatorrella cerebriformis* (Dodge) Filson in *Lichenes Antarctica Exsiccati*, Fasc. I n° 4, and accordingly, this material, which is fertile and with mature asci, was examined. The apothecial and ascus structure were found to be similar to those of *Acarospora chlorophana* (Wahlenb.) Mass., with which it also is very similar in habit. The thallus structure is identical. Thus it is concluded that what was called *Biatorrella cerebriformis* by Filson is *Acarospora chlorophana*. *Biatorrella cerebriformis* was originally described as *Candelariella cerebriformis* by DODGE (1948). The type of this taxon has not been available.

MURRAY (1963) described *Biatorrella antarctica* from Victoria Land.

FILSON (1975 b) concluded that it was conspecific with *Biatorrella cerebriformis* (Dodge) Filson, but he did not state whether he saw the type of *Candelariella cerebriformis* Dodge, or of *Biatorrella antarctica* Murray. The type of *Biatorrella antarctica* (WELT) was investigated and found to be conspecific with *Acarospora chlorophana*. The type of *Biatorrella antarctica*, *Acarospora chlorophana* from Vestfjella and *A. chlorophana* from mountain areas in western Norway all contain rhizocarpic acid and one (two ?) fatty acids.

#### *Acarospora gwynni* Dodge et Rudolph

Pulvinate areolae 1-3 mm in diam., often merging into a crust. Hymenium 200-250  $\mu$ m high. Spores 2-2.5 x 2  $\mu$ m. TLC : rhizocarpic acid.

KASHIWADANI (1970) found long, yellow needles after acetone extraction of Antarctic material of the same species, but the identity of this substance is obscure. The investigations of HUNECK (1980) and LEUCKERT & BUSCHARDT (1978) show that the chemistry may be of considerable help in the taxonomy of this difficult group. All species of subgenus *Xanthothallia* have rhizocarpic acid, but most species seem to have additional substances, mainly



aliphatic acids and norstictin.

WEBER (1968) considered *A. gwynnii* to be a monstrous modification of *A. chlorophana* (Wahlenb.) Massal. FILSON (1975 b) maintains that the cerebriform growth habit of *A. gwynnii* is also found when specimens grow in sheltered positions, and is thus not merely an environmental modification. At present, it seems best to keep them as two different species.

The type of *A. gwynnii* has not been available. A comparison between *A. gwynnii* and *A. chlorophana* is shown in Tab. 1.

	<i>Acarospora chlorophana</i> (Wahlenb.) Mass.	<i>A. gwynnii</i> Dodge & Rudolph
Chemistry	Rhizocarpic acid, acaranoic acid, acarenoic acid (HUNECK 1980)	rhizocarpic acid (DOΦ)
Spores	3.4 x 1.5-1.7 (MAGNUSSON 1929)	2-2.5 x 2 (DOΦ) 3.5 x 2 (FILSON 1966) 3.5 x 1.8 (DODGE 1973) c.3 x 1.5 (LINDSAY 1972) 3.4 x ? (KASHIWADANI 1979)
Apothecia	emergent, up to 2.5 mm disc plane to convex, yellow	immersed, diam. up to 0.3 mm, disc ± concave, brown

Tab. 1. — A comparison between some characters in *Acarospora chlorophana* and *A. gwynnii*. Spores measures in  $\mu\text{m}$ .

### *Buellia foecunda* Filson

Thallus small, wrinkled, subglobose, grey; verrucae 2-3 mm in diameter, on stone. Prothallus white, fimbriate, thin. Chemistry not investigated because of scanty material. Apothecia numerous on each verruca, black, subglobose to flat, 0.05-0.1 mm. Hymenium 35-65  $\mu\text{m}$  high, colourless except in upper part where it is bluish-black. Hymenium and excipulum  $\text{HNO}_3$  + red, K-; P and C not investigated because of scanty material. Spores 8 in ascus, ca. 10 x 5  $\mu\text{m}$ . Paraphyses straight to undulating, unbranched, very weakly clavate at tip. Excipulum dark with blue tinge, at margin with apparently pseudoparenchymatous tissue or gelatinized, closely adpressed cells with angular lumina. Subhymenium thin in young apothecia, thick in old, colourless, composed of ± long, interwoven hyphae. Hypothecium thin, colourless in young apothecia, but often yellowish in old, composed of gelatinized, closely adpressed hyphae with angular lumina.

The specimens were compared with the type (MEL) and found to be similar in all essential details. Also in the type the upper part of the hymenium is bluish-black. The type material was too small for TLC analyses.

Loc. : 9.

*Buellia frigida* Darb.

TLC : norstictic acid.

Loc. : 3, 4, 6.

*Buellia illaetabilis* Lamb

The details of the main part of the collection are : crust on stone, mostly 5-6 mm in diameter. Areolae grey, rounded to angular in outline, flat, mostly 0.3-0.4 mm diam., on black prothallus that creeps among protruding crystals in rock. Apothecia black, flattened to subglobose, 0.2-0.6 mm in diameter, when young with a thin margin, disappearing with age. Hymenium ca. 60  $\mu\text{m}$  high, colourless except in upper parts where it is faint blue-green and where there are black-brown granules. Hymenium and excipulum  $\text{HNO}_3^+$  red after 5 min.,  $\text{K}^+$  blue,  $\text{C}^-$ ,  $\text{P}^-$ . Hymenium and hypothecium  $\text{I}^+$  blue. Excipulum brown to black, composed of long hyphae subparallel to paraphyses. Hypothecium pale brown, composed of  $\pm$  long interwoven hyphae. Spores 8 in ascus, 12-14 x 6-8  $\mu\text{m}$ . Paraphyses straight, unbranched, slightly clavate (3-4  $\mu\text{m}$ ) at tip.

One collection (loc. 4) differs in consisting of small clusters, 1-2 mm diam., of grey verrucae, each individually 0.4-0.5 mm diam., and usually with an apothecium on each. The apothecia are 0.2-0.3 mm diam., black and convex, and with a very narrow brown-black excipulum. Hypothecium dark reddish-brown. Hymenium brownish-black in upper parts, otherwise more or less colourless. Paraphyses discrete, end cell not clavate, ca. 1.5  $\mu\text{m}$  diam. Spores ca. 12 x 15  $\mu\text{m}$ , not constricted at septum.

Chemical reactions of the apothecium are similar to the specimens from loc. 9, and the differences between the two collections are regarded as being mainly due to environmental conditions, and within the normal range of variation of a species. TLC negative.

LAMB described this species in 1968 from North-east Graham Land (northern tip of Antarctic peninsula). Later, LINDSAY (1972) reported it from Vestfjella mountains with a cf. notation. His material has been examined and found to be the same as the taxon reported here. The type (BM) has also been investigated and found to be similar to the present material in all essential details. LAMB (1968) found a  $\text{K}^+$  yellow,  $\text{P}^+$  yellow reacting substance in his specimens. The present collection seems to be an inactive phase of the species.

Loc. : 4, 9.

*Caloplaca citrina* (Hoffm.) Th. Fr.

Syn. : *Pyrenodesmia mawsoni* Dodge

This taxon falls within the variation limits of *Caloplaca citrina* (Hoffm.) Th. Fr., which was also the conclusion of FILSON (1974) who distributed it in his *Lichenes Antarcticae Exsiccati*, Fasc. 1. LINDSAY (1972) made the combi-



nation *Caloplaca mawsoni* (Dodge) Lindsay for the same taxon (material in O) but does not discuss its affinities with *C. citrina*. Neither FILSON nor LINDSAY stated whether they saw the type of *Pyrenodesmia mawsoni*. The type of this taxon has not been available. Sterile specimens, overgrowing mosses and other lichens.

Loc. : 4.

*Candelariella hallettensis* (Murray) Øvst., comb. nov.

Basionym. : *Lecidea hallettensis* Murray, *Trans. Roy. Soc. New Zealand, Bot.* 2 (5) : 67, 1963.

Syn. : *Candelariella antarctica* sensu Filson 1975, ? *Protoblastenia citrina* Dodge 1948.

This is the same taxon as that distributed by FILSON as *Candelariella antarctica* Filson in *Lichenes Antarctici Exsiccati*, Fasc. I, 4. *Candelariella antarctica* is a new name for *Protoblastenia citrina*, which, according to FILSON (1975 b) should be placed in the genus *Candelariella* because of its K<sup>-</sup> reaction. The change of name was necessary because of the earlier homonym *Candelariella citrina* B. de Lesd. However, FILSON (1975 b) does not say whether he saw the type of *Protoblastenia citrina*, and it has not been possible to obtain this type. *C. hallettensis* is an 8-spored *Candelariella* with apothecium and ascus structure typical of the genus. It bears some resemblance to *C. kuusamoensis* Räs., but this is a 16-spored species, and some of the granules are usually distinctly flattened. Overgrowing bryophytes and other lichens.

Loc. : 1, 2, 6, 7, 8.

*Neuropogon antarcticus* DR.

The material consists of one specimen, which has a height of 3-4 cm. The medulla is dense, and the soralia are pale, eroded and confluent. The width of the central axis is 45 to 60 % of the width of the main branch (measured ca. 0.5 cm above the base), and there is a pronounced papillation on lower parts of the main branches. The specimen agrees well with the description of *N. antarcticus* given in LAMB (1964). The identification was confirmed by Miss F.J. Walker (BM). TLC : usnic acid.

Loc. : 7.

*Neuropogon sulphureus* (Koenig) Hellbom

About 15 specimens, 0.5 to 4 cm tall. Medulla more or less lax, and soralia usually subglobose and prominent. The relative width of the central axis, a character used by LAMB (1964) in his treatment of this genus, is mainly between 30 and 50 % of the total width of the main branch (measured ca. 0.5 cm above the base), but in two specimens the value was between 50 and 70 %. KASHIWADANI (1970) who investigated the same species in the Antarctic, also found some variation in this character, thus it is probably of no great

diagnostic value. The identification was confirmed by Miss F.J. Walker (BM). TLC : usnic acid. One specimen collected in 1966 (O), contained an unidentified accessory substance (F.J. Walker in litt.).

Loc. : 1, 2, 3, 4, 5, 7.

### *Lecanora expectans* Darbish

Thallus white, scabrid, ecorticate, growing over bryophytes and other lichens, some places densely covered with apothecia. Apothecia 0.3-0.8 mm in diameter, disc black, white-pruinose becoming brownish when wet, margins concolorous with thallus, scabrid and a little undulating. Hymenium ca. 100  $\mu$ m high. The margin is filled with algae, and has an outer part of darkened tissue. The paraphyses are not gelatinous, often free, but branched so as sometimes to appear anastomosing. Spores 11-13 x 5-6  $\mu$ m. TLC : negative.

The specimens have been compared with specimens in FILSON's Lichenes Antarctici Exsiccati Fasc. I, 15 (O) and found to be similar in all essential details. The type was not traced.

Loc. : 4, 7, 8.

### *Lecidea* sp.

Thallus on gravel and small stones, white, eroded, 3-4 cm in diameter, crustose, no effiguration seen, some places new cream-coloured verrucae developed on old thallus. Cortex of verrucae of variable thickness, with intricate hyphae. Apothecia flat, black, to 1 mm diam., margins thin, undulating, irregular in old fruits. Hymenium ca. 50  $\mu$ m high, with a faint red-brown tinge,  $\text{HNO}_3^+$  red,  $\text{K}^+$  blue in upper parts,  $\text{C}^-$ ,  $\text{P}^-$ . Subhymenium colourless or same colour as hymenium, 30-50  $\mu$ m high, of plectenchymatous tissue. Scattered algae below subhymenium. Prominent excipulum, composed of radiating, rather thick walled, adglutinated hyphae 1.5-2  $\mu$ m thick, in thin sections colourless or with a black-blue tinge. Spores 8 in ascus, ca. 15 x 10  $\mu$ m, containing a number of granules. Paraphyses compact, with external granules, undivided, expanded into a dark, sometimes blue-green end cell, 4-6  $\mu$ m in diameter.

A number of *Lecidea* s. lat. species were described from the Antarctic by HUE, DODGE & BAKER, and DODGE. It is usually impossible to get access to the types of most of these species, and the descriptions are often not very good. Thus the present species may well be described.

### *Physcia caesia* (Hoffm.) Fűrnröhr

Syn. : ? *Parmelia leucoblephara* Dodge & Baker

Thallus mostly irregular in outline, usually coalescing with other thalli and then several cm in diam. Usually adpressed to the substratum but lobe-ends sometimes protruding. White to pale blue-grey, white-pruinose. Lobes radiating, concave to convex, 0.5 to 1 mm, usually overlapping. Soralia rare, terminal on lobes, crateriform. Underside white in young parts, becoming brown central-



ly. Rhizinae simple to branched, pale to brown. Upper cortex paraplectenchymatous, lower cortex prosoplectenchymatous.

Good material exists of this taxon, which is said never to have been found fertile in the Antarctic (DODGE 1973, sub nomen *Parmelia leucoblephara*). It was compared with material from the same area that LINDSAY (1972) determined as *Parmelia leucoblephara*, and has found to be the same taxon. The type of *P. leucoblephara* has not been available. According to DODGE (l. c.) it has white (hyaline) cilia along the margin, but this is not so, it is rhizinae on the lower surface close to the margin. As to the soralia, they are rarely found and probably mostly eroded. Growing over bryophytes and other lichens. The specimens were determined by R. Moberg (UPS). TLC : zeorin and atranorin.

Loc. : 2, 3, 8.

*Pseudephebe minuscula* (Nyl. ex Arnold) Brodo & D. Hawksw.

Growing on rock.

Loc. : 5, 7, 9.

*Rhizoplaca melanophthalma* (Ram.) Leuck. & Poelt

One well-developed specimen and a few small ones. Earlier noted from the area by LINDSAY (1972). On rock. TLC : usnic acid and zeorin.

Loc. : 5, 7, 9.

*Rinodina olivaceobrunnea* Dodge et Baker

Thallus consisting of closely packed granules; sterile granules 0.4-0.6 mm diam., white, on bryophytes. The chemistry was not investigated because of scanty material. Apothecia irregular in general outline, mostly one on each granule, margin concolorous with thallus, disc pale brown, slightly pruinose. Apothecia 0.5-0.6 mm diam. Hymenium 130-150  $\mu$ m, colourless. Subhymenium of variable depth, colourless. Thalline margin with a few algae, and composed of long, densely interwoven hyphae, outermost parts with apparent necrotic layer. Algal layer not under whole subhymenium. Spores constricted at septum, with thickened walls and septum, angular to rounded lumina, ca. 27 x 11  $\mu$ m. Paraphyses simple, undulating, tips not clavate. The white colour of the thallus is due to a necrotic layer.

Beside the quite distinct *Rinodina nimbosa*, there are two species of *Rinodina* growing over bryophytes in Antarctic and subantarctic areas. They are easily distinguished on the spore size : *R. turfacea* (Wahlenb.) Koerb. is large-spored, and *R. olivaceobrunnea* Dodge & Baker is small-spored. The present collection belongs to the small-spored taxon, although the spore wall is thicker and the lumina more angular than in specimens of *R. olivaceobrunnea* distributed by Filson in *Lichenes Antarcticae Exciccati*, Fasc. I, n° 18 (O). *R. olivaceobrunnea* is widespread in the continental Antarctic, while *R. turfacea* is found on the subantarctic islands (FILSON 1975 a, LINDSAY 1972, LAMB 1968).

Loc. : 10.

*Umbilicaria aprina* Nyl.

Specimens referred to *U. aprina* vary considerably in appearance. The most striking variations are in thallus size, colour and texture of upper surface. The diameter lies between 0.5 and 6 cm, and is obviously of little taxonomic significance, the variation in surface rugosity may likewise not be significant. On the other hand, a character such as colour is related to the texture of the upper surface, and is obviously dependent on external conditions. TLC : gyrophoric acid.

Loc. : 1, 3, 4, 6, 10.

*Umbilicaria decussata* (Vill.) Frey

Thallus to 3.5 µm in diam., upper surface with a network of low ridges, dark grey, pruinose. Lower surface smooth, black, sometimes grey towards margins. Margin often slit and eroded. The smallest specimens, 3-4 mm in diameter, have an areolate surface lacking ridges, and are close to the description of *U. leiocarpa* var. *nana* Vainio (VAINIO 1903, LLANO 1950, DODGE 1973), from the island Brabant, 64° 21'S.

The ridges arise gradually as the specimen grows, a development which is clearly seen in the Vestfjella material. In addition, the upper surface of these specimens are often weatherworn by sand and ice. This is obviously the case with the type of *U. leiocarpa* var. *nana* (TUR), which was examined. The most protected part of the specimens during such conditions is probably the lower surface, which was examined by SEM on one of the type specimens, and on three of the small specimens from Vestfjella. No difference was found. Thus, it is not possible to distinguish between the type of *U. leiocarpa* var. *nana* and young specimens of *U. decussata*. *U. leiocarpa* var. *nana* has never been found fertile in the Antarctic (LLANO 1950), neither have mature, unambiguous specimens of *U. leiocarpa* been found there. Hence *Umbilicaria leiocarpa* var. *nana* Vainio is reduced to a synonym of *U. decussata*.

TLC : no substances found. LINDSAY (1972) found gyrophoric acid. Thus there seems to be two chemotypes, as in Fennoscandia (DAHL & KROG 1973).

Loc. : 1, 2, 4, 6, 7, 9.

*Xanthoria candelaria* (L.) Th. Fr.

On rock.

Loc. : 3.

*X. elegans* (Link) Th. Fr.

Very common and variable.

Loc. : 1, 2, 3, 4, 6, 8.



## DISCUSSION

LINDSAY (1972) recognized 13 lichen taxa from the present study area. Here 23 taxa are noted, five of which, however, are only determined to genus. Ten of the 23 taxa were not noted by LINDSAY, while all the species recorded by him were also present in the 1976 and 1979 expedition material. It should be noted that no botanists have yet visited the area, and a visit by a trained lichenologist would certainly increase the number of species found.

A number of apparently bipolar species occur both in the continental Antarctic and in Arctic or northern Europe, viz. *Acarospora chlorophana*, *Caloplaca citrina*, *Neuropogon sulphureus*, *Physcia caesia*, *Pseudephebe minuscula*, *Rhizoplaca melanophthalma*, *Rinodina olivaceobrunnea*, *Umbilicaria aprina*, *U. decussata*, *Xanthoria elegans* and *X. candelaria*. A few of these occur also on the subantarctic islands: *Physcia caesia*, *Rhizoplaca melanophthalma*, *Umbilicaria decussata* and *Xanthoria candelaria*. The majority of these are ornithocoprophilous. *Neuropogon antarcticus* is a circumpolar species found both in the continental and maritime parts of the Antarctic area. Apparently restricted to the continental Antarctic are: *Acarospora gwynnii*, *Buellia foecunda*, *B. frigida*, *B. illaetabilis*, *Candelariella hallettensis* and *Lecanora expectans*.

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